



**Technical talk on Development & Fabrication of Low to High Strength and Antiballistic of M'sian Bamboo Laminated Composites by Prof. Dr. Aidy Ali**

by Ir. Dr Huzein Fahmi bin Hawari

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On 10th August 2020, Electronic Engineering Technical Division (eETD) conducted an online evening talk on development & fabrication of low to high strength and antiballistic of Malaysian bamboo laminated composites presented by Prof. Dr. Aidy Ali from Universiti Pertahanan Nasional Malaysia (UPNM). The event well was attended by 27 participants. The session started at 6.00pm with short introduction of bamboo as natural fibre with different varieties available and geometries of bamboo specimens. For the project, buluh semantan was selected due to its availability and suitable geometries. Before it can be used as an anti-ballistic composite, the buluh semantan must be cut to a specific dimension and then moulded as laminated strip.



*Figure 1: The transformation of bamboo for antiballistic material*

Next, the bamboo is then woven with a thickness range of 0.4mm to 0.6mm before being laminated with e-glass composite. Several layers of the fabricated composites were prepared and sent for a mechanical test to measure its fatigue and fracture toughness. From the testing, the fatigue strength of the composite at 30 MPa registered the highest with  $1 \times 10^6$  cycles. The 3-mm thickness were also observed to provide the best fatigue resistance.

The next part of the technical talk was about the ballistic limit testing (v50) conducted on the composite. The test was conducted using a test gun machine per the NIJ Standard. During this test, several test bullets such as 22 Caliber LR, 9 mm, 357 Magnum and etc were used. Prior to each test, several information for example, the bullet weight and reference velocity were first recorded.



*Figure 2: Field testing conducted*

Shooting tests were successfully performed in order to determine the ballistic limit (V50) following the military standard of ML-STD-6682, it was discovered that 4:18 WB: WEG was able to withstand the bullet up to 482 m/s, which is more than the minimum speed to qualify for Level of National Institute of Justice (NIJ) IIIA standards. In the case of,9:4:9 WEG: WB:WEG laminated arrangement, the materials only reached level II of the NIJ standards at 414 m/s.



*Figure 3: The bullet did not penetrate the laminated woven bamboo/woven E-glass*

Finally, Prof Aidi also shared some of the awards and publication pertaining to the hybrid bamboo composites. The Q&A session went well as participants were interested to understand more on next strategy for the hybrid bamboo composites. The talk was completed about 7.30pm. Overall, it was a good learning experience for the IEM members who took part in the talk.

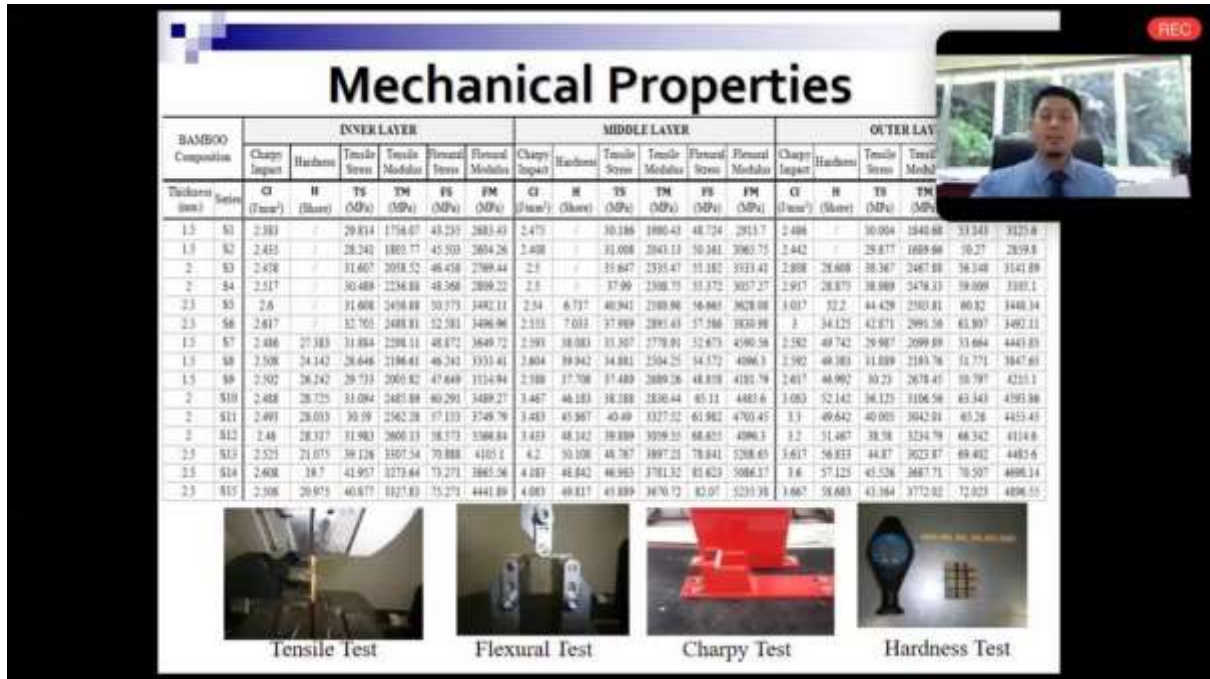


Figure 4 Prof Aidi elaborating mechanical properties of bamboo composites